Fundamental Equations of State for Hydrocarbons in the Critical Region

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Thermodynamic properties of fluid in the critical region are important for applications in novel supercritical and near-critical technologies. Recently developed crossover equations of states enable one to obtain reliable predictions for the data in this region. During the last ten years the fundamental crossover equations of state have been developed for many substances: for noble gases, hydrocarbons (from methane to butane), carbon dioxide, water, and for a number of refrigerants. In this talk we present the fundamental crossover equations of state for hydrocarbons from methane to n-octane, for cyclohexane, benzene, toluene, and for dimethylbenzene isomers. Our equations are based of the crossover approach formulated by Sengers and his co-workers for the Helmholtz free energy. We have compared all available experimental data obtained by various research groups with the results calculated with the crossover equations of state. For some hydrocarbons we compare the results of calculations with the parametric crossover model developed by Kiselev. We have also established a general trend in behavior of the caloric function of the equation of state and developed a method to obtain this function from the ideal-gas heat capacity data.